

Lipids

Learning objective 1.5.A Describe the structure and function of lipids.

Name:

Date:

Period:

Use the tool **The Kink Test**. Work on the **The kink test** tab for Parts 1 to 3, then switch to **Predict the effect** for Part 4.

Part 1 • Predict, then check

All five of these fatty acids are drawn at the same scale, so only their shape differs. Before you press any of them, predict whether each will be **solid or liquid** at room temperature. Then press each one and record what the tool reports.

Fatty acid	C=C double bonds	I predict	Actually at 20 °C
Palmitic acid (16:0)			
Stearic acid (18:0)			
Oleic acid (18:1)			
Linoleic acid (18:2)			
Alpha-linolenic acid (18:3)			

Part 2 • Hold the length constant

The four 18-carbon fatty acids all have the same chain length, so double bonds are the only thing that changes between them. Record the melting point the tool gives for each.

Fatty acid	Double bonds	Melting point (°C)	Solid or liquid at 20 °C
18:0			
18:1			
18:2			
18:3			

1. Describe the pattern in the melting point column as the number of double bonds increases.

Part 3 • Why the kink matters

Look at the packing panel underneath each molecule, and compare 18:0 with 18:3. Both are drawn at the same scale, so the only difference is shape.

2. Describe the difference between a saturated and an unsaturated fatty acid in terms of the bonds between their carbon atoms.

3. Describe what you see in the packing panel for 18:0 compared with 18:3.

4. Explain why a kinked tail gives a lower melting point than a straight one. Connect packing to the energy needed to separate the molecules.

Part 4 · Predict the effect

Switch to the **Predict the effect** tab and work the cards. Then answer these on your own. Each answer needs a **prediction** and the **reasoning** behind it.

5. A food manufacturer adds hydrogen across the double bonds of a liquid vegetable oil, removing them. Predict the effect on the product and justify your prediction.

6. A plant moved to a colder climate switches on an enzyme that inserts extra double bonds into its membrane fatty acids. Predict the effect on those membranes and explain why this helps the plant survive the cold.

7. Describe the function of phospholipids and of cholesterol in an animal cell membrane.

What the model simplifies

The packing panel shows three tails lying flat in two dimensions. Real fats pack in three dimensions and a real membrane is a bilayer two molecules thick, so this is a cross-section of the idea rather than a picture of a membrane.

Only the fatty acid tail is drawn. A triglyceride joins three of these to a glycerol backbone; a phospholipid joins two plus a phosphate head group.

Solid and liquid switch cleanly at the melting point. Real fats are mixtures of several fatty acids and soften over a range of temperatures instead of at a single one.

Every molecule is drawn at the same bond length, so shape is the only visual difference between them. Melting points are published physical constants.